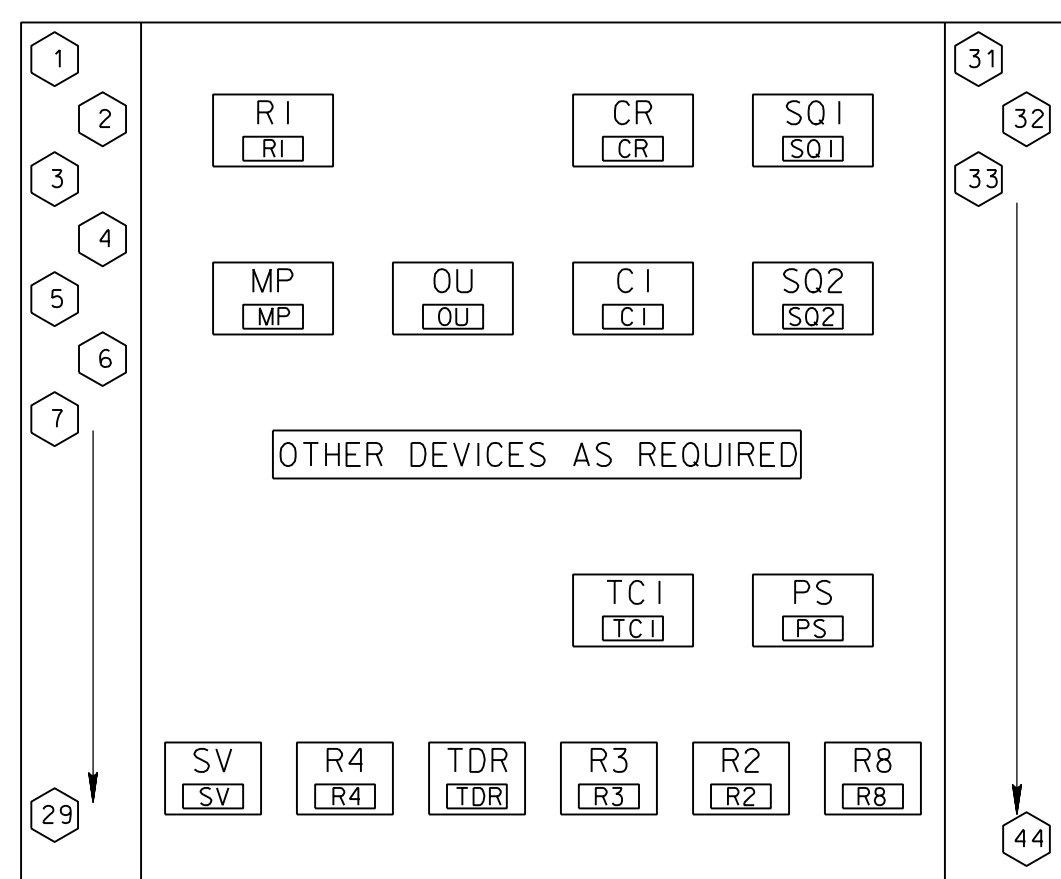


ELEMENTARY DIAGRAM

TIME CLOCK CONTACTS ARE SHOWN IN THE UNOCCUPIED (NORMALLY OPEN) POSITION



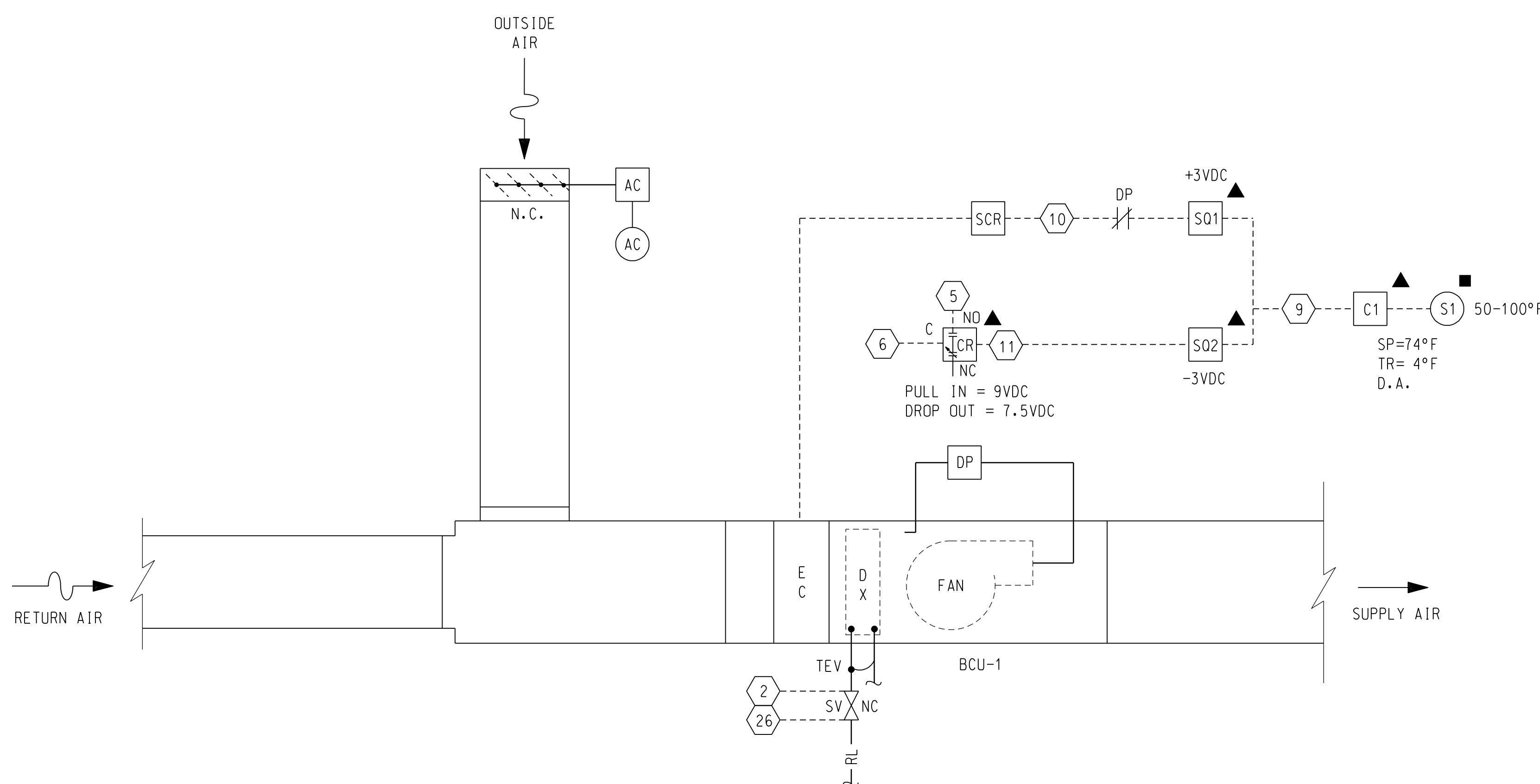
UNIT CONTROL PANEL DETAIL

NOTES:

1. INSTALL COMPONENTS IN THE LOCATIONS INDICATED.
2. USE A CONSISTENT COLOR CODED WIRING SCHEME.
3. LABEL ALL WIRES ENTERING OR LEAVING THE CONTROL PANEL.
4. CONNECTIONS TO THE ELECTRICAL TERMINAL STRIP SHALL BE IN ACCORDANCE WITH THE CONTROL SCHEMATIC AND THE ELEMENTARY DIAGRAM.
5. LINE VOLTAGE TEST POINTS AND DC VOLTAGE TEST POINTS SHALL BE LOCATED ON OPPOSITE SIDES OF THE PANEL.
6. PANEL SHALL BE WALL MOUNTED.





HVAC CONTROLS SYSTEM

THIS HVAC CONTROL SYSTEM WAS DESIGNED USING BARBER-COLEMAN CONTROLS AS A REFERENCE. OTHER MANUFACTURERS' CONTROLS ARE PERMITTED. DETAILS SHOWN WERE USED TO DEFINE THE CONTROL STRATEGIES AND, MAY BE CHANGED TO MEET OTHER MANUFACTURERS' COMPONENTS AS LONG AS THE STRATEGIES AND ACCURACY OF CONTROL ARE NOT CHANGED. ACTUAL TERMINAL NUMBERING, CONTROL COMPONENTS, AND CONTROL SETPOINTS SHALL BE DOCUMENTED IN CONTRACTOR SUBMITTALS AS REQUIRED BY THE SPECIFICATION.



CONTROL SCHEMATIC

SYSTEM OPERATING SCHEDULE								
HEATING COIL				COOLING COIL				
ROOM TEMP.	C _{OUT} ^{Cl}	V _{OUT} ^{Sq1}	IFB DAMPER POSITION	ROOM TEMP.	C _{OUT} ^{Cl}	V _{OUT} ^{Sq2}	DIRECTION OF TEMP. CHANGE	"CR" STATUS
68	3	6	FULLY OPEN	72	9	6	INCREASING	OFF
70	4.5	7.5	50% OPEN	74	10.5	7.5	INCREASING	OFF
72	6	9	CLOSED	78	12	9	INCREASING	SWITCHES "ON"
74	7.5	10.5	CLOSED	80	13.5	10.5	INCREASING	ON
76	9	12	CLOSED	78	12	9	DECREASING	ON
78	10.5	13.5	CLOSED	74	10.5	7.5	DECREASING	SWITCHES "OFF"
80	12	15	CLOSED	72	9	6	DECREASING	OFF

LEGEND	
SP	SETPPOINT
TR	THROTTLING RANGE
DA	DIRECT ACTING
NC	NORMALLY CLOSED
DIFF	DIFFERENTIAL
C	COMMON
RA	REVERSE ACTING
	ELECTRICAL TERMINAL POINT
	MOUNT IN UNIT CONTROL PANEL
	MOUNT IN MOTOR CONTROL CENTER
	MOUNT IN SPACE

DESCRIPTION OF COMPONENTS

C1	ELECTRONIC, PROPORTIONAL, SINGLE INPUT TEMPERATURE CONTROLLER WITH A THROTTLING RANGE OF 4°F (FIXED OR ADJUSTABLE) AND DIRECT ACTION. SETPOINT SHALL BE ADJUSTABLE 55°-85°F MINIMUM.	R3	SPDT RELAY. 120 VAC COIL. 24 VDC CONTACTS.
C2	TEMPERATURE CONTROLLER COMPATIBLE WITH SCR POWER COMPONENT, PROVIDING PID TEMPERATURE CONTROL TO MATCH THE RESPONSE SPEED OF THE SCR POWER CONTROLLER, CONTROLLER SUPPLIES A 40-20 mADC DEMAND SIGNAL TO THE POWER CONTROLLER (SCR) WHICH TRANSLATES TO 0-100% POWER TO LOAD.	S1	A REMOTE, ELECTRONIC ROOM TEMPERATURE SENSOR COMPATIBLE WITH CONTROLLER C1.
CR	A SPDT RELAY WITH 120 VAC CONTACTS, CONTROLLED BY A DC VOLTAGE.	SCR	SILICON CONTROLLED RECTIFIER POWER CONTROLLER PROVIDING A HIGHLY REPEATABLE MEANS OF VARYING THE POWER TO THE ELECTRIC RESISTANCE HEATING COIL AND HEATED LOAD. DIFFERENTIAL OF PLUS OR MINUS 1/2 DEGREE F. REQUIRED. PROVIDES PROPORTIONAL POWER TO THE HEATER LOAD.
D1,D2	AN ELECTRIC ACTUATOR, TWO-POSITION, SPRING RETURN.	SQ1	ELECTRONIC SEQUENCER WITH CONDITIONS THE OUTPUT SIGNAL FROM A CONTROLLER SUCH THAT THE CONTROLLER VOLTAGE IS INCREASED OR DECREASED BY A FIXED AMOUNT. MUST BE ADJUSTABLE TO PLUS OR MINUS 4.5 VDC MINIMUM.
DP1	FAN DIFFERENTIAL PRESSURE SWITCH.	SQ2	SAME AS SQ1.
DP2	FILTER DIFFERENTIAL PRESSURE SWITCH.	SV	A REFRIGERANT LIQUID LINE SOLENOID VALVE. NORMALLY CLOSED. 120 VAC.
DS	ELECTRIC DISCONNECT SWITCH INTERLOCKED WITH MAIN DISCONNECT SWITCH. 120 VAC CONTACTS.	TC1	A SEVEN-DAY TIME CLOCK WITH A MINIMUM SEVEN ON AND SEVEN OFF SWITCH TRIPPERS (FULLY ADJUSTABLE). MINIMUM OUTPUT IS TWO SPST SWITCHES. CLOCK SHALL HAVE EIGHT-HOUR SPRING BACKUP OR CONTINUOUSLY CHARGED BATTERY BACKUP.
DA	AN ELECTRIC, REMOTE, OUTDOOR, TWO-POSITION THERMOSTAT WITH A DIFFERENTIAL OF 4°F (FIXED OR ADJUSTABLE). SETPOINT SHALL BE ADJUSTABLE 0°-65°F AS A MINIMUM.	TEV	THERMOSTATIC EXPANSION VALVE.
PS	A REGULATED DC VOLTAGE SUPPLY COMPATIBLE WITH ALL COMPONENTS REQUIRING DC VOLTAGE.		
R1,R2	ELECTRIC RELAY. 120 VAC COIL. 120 VAC CONTACTS.		

SEQUENCE OF CONTROL

GENERAL :

THE SYSTEM CONSISTS OF AN AIR COOLED CONDENSING UNIT (ACCU-1) AND A TOILET EXHAUST FAN INTERLOCKED WITH A HORIZONTAL BLOWER COIL UNIT EQUIPPED WITH A ELECTRIC RESISTANCE HEATING COIL, DX COOLING COIL, AND FILTER SECTION. THE FAN CONTROL CIRCUIT SHALL INCLUDE TIMED OCCUPIED-UNOCCUPIED CONTROL.

TIMED CONTROLS:

SUMMER OCCUPIED:

BCU-1 SUPPLY FAN RUN THRU (TC) CONTACTS, WITH OUTSIDE AIR DAMPER (D1) OPEN. DX COIL FOLLOWS DX COOLING COIL CONTROL.

SUMMER UNOCCUPIED:

BCU-1 OUTSIDE AIR DAMPER (D1) SHALL CLOSE. FAN SHALL BE OFF. CONDENSING UNIT SHALL BE OFF.

WINTER OCCUPIED:

BCU-1 OUTSIDE AIR DAMPERS (D1) SHALL BE OPEN. BCU-1 FAN SHALL BE ON THRU TIME CLOCK (TC) CONTACT. ACCU-1 SHALL BE LOCKED OUT. ADMIN SPACE SENSOR, THRU CONTROLLER (C1), MODULATES IFB DAMPERS (D5) TO MAINTAIN SPACE TEMPERATURE AT 70°F (ADJUSTABLE). EF-1 IS ON.

WINTER UNOCCUPIED:

OUTSIDE DAMPERS (D1) SHALL BE CLOSED. FAN SHALL BE OFF. EF-1 IS OFF.

ELECTRIC HEATING COIL CONTROL:

THE ZONE TEMPERATURE SENSOR (S1), THRU CONTROLLER (C1) AND SEQUENCER (SQ1) AND (SCR), SHALL MODULATE ELECTRIC RESISTANCE HEAT COIL FROM FULL HEATING TO NO HEATING OVER A ZONE TEMPERATURE RANGE OF 68°F TO 72°F.

DX COOLING COIL CONTROL:

OCCUPIED MODE:

THE SPACE TEMPERATURE SENSOR (S1) THRU CONTROLLER (C1) AND SEQUENCER (SQ2) SHALL OPEN THE REFRIGERANT LIQUID LINE SOLENOID VALVE (SV) THRU RELAY (CR) ABOVE 78°F. THE SOLENOID VALVE SHALL CLOSE UPON A SUBSEQUENT DROP IN THE ZONE TEMPERATURE TO 74°F.

UNOCCUPIED MODE:

CONDENSING UNIT SHALL BE OFF, THRU (OA) THERMOSTAT.

TOILET EXHAUST FAN CONTROL:

THE EXHAUST FAN SHALL OPERATE AND EXHAUST AIR DAMPER (D6) OPEN DURING THE OCCUPIED MODE AND SHALL BE DEENERGIZED DURING THE UNOCCUPIED MODE.

CONDENSING UNIT CONTROL:

WITH OUTDOOR TEMPERATURE ABOVE 65°F, RELAY (R2) SHALL ENERGIZE THE SOLENOID VALVE (SV1). ACCU-1 SHALL CYCLE THE COMPRESSOR(S) AND/OR UNLOAD THE CYLINDERS FOR THE MINIMUM REQUIRED STAGES OF REFRIGERATION REDUCTION BY SENSING SUCTION LINE PRESSURE (PUMP DOWN CONTROL). SF-2 SHALL RUN IN OCCUPIED MODE. SEE CONTROL ON SHT. M15.

\$\$ – THINK VALUE ENGINEERING – \$\$			
Revisions			
Symbol	Descriptions	Date	Approved
U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS OMAHA, NEBRASKA			
Designed by: G.D.R.	SITE NAME OMAHA DISTRICT DESIGN GUIDE HVAC CONTROLS (BCU-1, EF-1, ACCU-1)		SITE LOCATION
Drawn by: K.E.M.			
Checked by: R.R.T.			
Reviewed by: K.A.H.	Plot Scale Ratio: 0833 : 1 Design File: STD07: oddgm605.dgn	Date: JUNE 2002	Sheet reference number:
Submitted by:	Spec. No.: DACA 45	Drawing Code: <div style="text-align: center; font-size: 2em;">X</div>	
Chief: MECH. FAC. Section	Contract No.: DACA 45		
M6.5			